Air Force Institute of Technology

AFIT Scholar

Theses and Dissertations

Student Graduate Works

3-2007

An Analysis of the Military Retirement System: How Does Retirement Return Influence Retention?

Derren P. Burrell

AN ANALYSIS OF THE MILITARY RETIREMENT SYSTEM: HOW DOES RETIREMENT RETURN INFLUENCE RETENTION?

THESIS

Derren P. Burrell, Major, USAF

AFIT/GCA/ENV/07-M3

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AFIT/GCA/ENV/07-M3

AN ANALYSIS OF THE MILITARY RETIREMENT SYSTEM: HOW DOES RETIREMENT RETURN INFLUENCE RETENTION?

THESIS

Presented to the Faculty

Department of Systems Engineering and Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science (Cost Analysis)

Derren P. Burrell, BS

Major, USAF

March 2007

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

AFIT/GCA/ENV/07-M3

AN ANALYSIS OF THE MILITARY RETIREMENT SYSTEM: HOW DOES RETIREMENT RETURN INFLUENCE RETENTION?

Derren P. Burrell, BS

Major, USAF

Approved:

___//Signed//___________________ __28 Feb 2007

Jeffrey S. Smith (Chairman) Date

___//Signed//___________________ __19 Feb 2007

Paul G. Hough (Member) Date

__//Signed//____________________ __22 Feb 2007

William K. Stockman (Member) Date

AFIT/GCA/ENV/07-M3

ABSTRACT

The cost of the current Department of Defense (DoD) defined-benefit retirement plan has long been a source of consternation within Congress and the DoD (Freedberg, 1999:35). Billed as being too costly in the private sector, many firms have elected to switch from defined benefit plans to defined contribution plans, most often a 401K retirement plan (Chassen, 1990:18). This thesis attempts to capture the effect of the current military retirement plan on rates of retention. The goal of this study is to be used as a tool should the Department of Defense decide to move from a defined-benefit plan to a defined-contribution plan. Previous studies (e.g., Asch et al., 1998) have explored different methods in comparing various retirement systems, largely based on organizations meeting their retention and performance goals. The model introduced in this study will test the extent to which the rate of return associated with the current military retirement system influences the organization's retention goals while simultaneously helping the individual meet his or her long-term financial security goals.

DEDICATION

This endeavor is dedicated first and foremost to my Lord and Savior Jesus Christ. Also to my wife and children, who remain the highest gift and calling that I have received.

ACKNOWLEDGMENTS

Getting through the rigor of the AFIT Government Cost Analysis (GCA) Program does prove you can teach an old dog new tricks, but not without a lot of help and encouragement from several different groups of people. I first acknowledge that without God in my life nothing would be possible, and I'm grateful for each day that He gives me. Next in importance comes my family, whom have been an ongoing source of support in each assignment over the last 12 years, and this tour has been no different.

I also would like to thank the AFIT instructors, if for nothing else their tremendous patience in imparting loads of wisdom on an over-taxed mind. My thesis advisor Lt Col Smith and readers Col (Ret.) Dr. Paul G. Hough and Lt Col (Ret.) Dr. Bill Stockman especially stand out as pillars of knowledge in this incredible journey. Finally, to the members of the GCA 07M class, I'm perpetually grateful for the tutoring and the good times—I hope we can serve together again down the road in our beloved Air Force.

Derren P. Burrell

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

PAGE

LIST OF TABLES

PAGE

AN ANALYSIS OF THE MILITARY RETIREMENT SYSTEM: HOW DOES RETIREMENT RETURN INFLUENCE RETENTION?

I. INTRODUCTION

Friedberg and Webb (2003:1) noted that defined benefit retirement plans have become considerably less common in the United States since the early 1980s, while defined contribution retirement plans have gained popularity. The evolution to defined contribution plans has occurred for several reasons, including the employer's cost certainty offered by fixed contributions, relief from investment risk, and lower costs, both in benefits paid out and administrative activities (Shankar and Miller, 2003:53). Like the private-sector, the cost of the Department of Defense's (DoD) defined-benefit retirement plan has long been a source of consternation within Congress and the DoD's leadership (Freedberg, 1999:35). Asch, Johnson, and Warner (1998:48) fueled this criticism, reporting that if DoD converted to a defined contribution plan it could reduce total manpower costs by about 6 percent and garner an annual savings of about $2.4 billion based on FY 1997 force levels. While DoD leadership has not been blind to these criticisms, they have accepted the trade-offs associated with the more expensive retirement system to help ensure proper recruiting and retention goals were met with the all volunteer force (DoD, 1992:684), and this mindset has remained largely unchanged since the retirement system's inception in 1947 (Asch and Warner, 1994b:xiii). The military retirement system functions as a strong retention tool, and a move to a defined contribution plan could jeopardize retention efforts to maintain a stable force (Asch and Warner, 1994a: 101).

While the recruiting and retention goals are still cornerstones of DoD leadership, escalating costs associated with modernization efforts and the Global War on Terror are forcing leaders to revisit the choice regarding a retirement plan (United States Congress: 2006:294). In fact, the President has directed the 10th Quadrennial Review of Military Compensation (QRMC), a congressionally-mandated and comprehensive review of all military compensation, to explore changes in the military's retirement system, encouraging the group to evaluate a shift to a defined contribution plan (Office of the President, 2005:1). Previous studies have focused on overhauling various retirement systems in differing capacities (Asch, et al., 1998:2, Johnston, et al., 2001:37). Asch et al. (1998) simulated the introduction of alternative retirement systems while simultaneously offering a method to assess the extent to which each of those systems relate to meaningful outcomes. The outcomes used to assess these alternatives centered on retention rates. Johnston et al. (2001) used a Monte Carlo simulation technique to determine the most effective defined contribution plan to meet or exceed defined benefit plan returns.

These studies will be used as a springboard to determine the effect of the retirement system's return on a member's choice to remain in the military or seek alternative employment. As noted, studies (e.g., Asch et al., 1998) have explored different methods in comparing various retirement systems, largely based on organizations meeting their retention and performance goals. The model introduced in this study will test the extent to which the rate of return associated with the current military retirement system influences the organization's retention goals while simultaneously helping the individual meet his or her long-term financial security goals.

For the defined contribution plan to represent an unambiguous improvement over a defined benefit system, it would have to (a) lower costs, (b) satisfy retention goals, and (c) represent an equivalent or superior benefit to individuals.

Specifically, this research will answer the following question, "How does the retirement plan's rate of return influence retention?" To do this, several factors thought to contribute to retention rates will be analyzed and compared. These factors include rank, the unemployment rate, whether the nation is at war, additional military pay incentives, and retirement return. This study will supplement the QRMC effort by conducting an independent analysis of the retirement system's impact on retention rates through the rate of return associated with the military retirement fund.

Past research has indicated defined contribution retirement plans result in lower overall costs by the employer. If this past research holds true and can be applied to the DoD, then savings associated with a shift to a defined contribution plan may be used towards other modernization and transformation initiatives to ensure the DoD meets the challenges of the future. This study (along with previous research) could serve as a roadmap to help the DoD make the change from a defined benefit plan to a defined contribution retirement system, if this research corroborates past research.

Definitions and Assumptions

Defined contribution plan. This retirement system is a sum of contributions that the worker and employers made throughout a career plus the growth or contraction of the fund over time as an investment vehicle, so that, from the worker's perspective, the timing of pension wealth accrual is not tied to the timing of retirement (Savych, 2005:23). The 401K plan in industry and the Thrift Savings Plan for federal employees are types of defined contribution plans. This research will focus on a shift to fully relying on the Thrift Savings Plan as the retirement system for DoD. A key characteristic of defined contribution plans is portability. When an individual becomes vested in the defined contribution plan with his or her company, that individual is able to take those contributions accrued to date to another company should he or she decide to shift employment.

Defined benefit plan. A retirement program that calculates a benefit based upon a formula, often a percentage of final average pay times years of service (Savych, 2005:23). The current military retirement system falls under this category, with 2.5 percent as the multiplier applied against the average basic pay for the highest 36 months of the individual's career.

Vesting provisions. These are provisions within a retirement plan that stipulate how and when workers earn the right to claim their retirement benefits (Asch and Warner, 1994a:82).

This study will not address the Guard and the Reserves, only active duty military across all of the service components. The reason for this assumption lies in the way appropriations law separates the funding associated with Guard and Reserve forces, and thus the implementation and management of retirement systems would be different in these two particular force components.

II. LITERATURE REVIEW

The purpose of this literature review is to give a history and roadmap of the retirement system as it has evolved--both in the private sector, public sector and the military. The military retirement system's roles and strategic objectives will be examined, and the challenges and criticisms of the current system will be discussed. Then a brief examination on how the retirement system's evolution in the private sector occurred will take place, in order to learn key lessons to aid the transition of the military's retirement plan. Finally, a specific assessment of the variables affecting retention decisions (to include the retirement system in effect) will help formulate the methodology employed in this research project to assess the impact of the retirement system on personnel retention.

Military Compensation Goals and Objectives

A primary goal of the military compensation system is to enable the military to meet manning objectives for force size, composition (i.e., the right mix of officers, enlisted at the right grade and skill level), and wartime capability (Asch and Warner, 1994a:iii). This goal does not explicitly consider the idea of cost effectiveness or cost efficiency in the area of compensation. While this indeed has been the case, the political landscape on which these goals were built has changed dramatically over the years. Escalating federal deficits and modernization costs coupled with the Global War on Terror have placed dynamic stress on the federal budget in recent years (GAO, 2006:4). The Department of Defense (DoD) has sought innovative ways to mitigate this stress; for example, the Air Force leadership initiated a reduction in endstrength by over 35,000 airmen to fund modernization (OSD, 2005b:3). Lieutenant General Brady, Deputy Chief of Staff, Manpower & Personnel, stated that personnel costs have increased 51% over the last ten years -- but number of personnel has remained relatively constant (see figure 1 below, Brady, 2006. With such a large outlay occurring each year it is not surprising the compensation program has been a target of constant debate (Asch and Warner, 1994b:1). A fresh look at different facets of the compensation system may be required to continue to capitalize the force in the most cost effective manner.

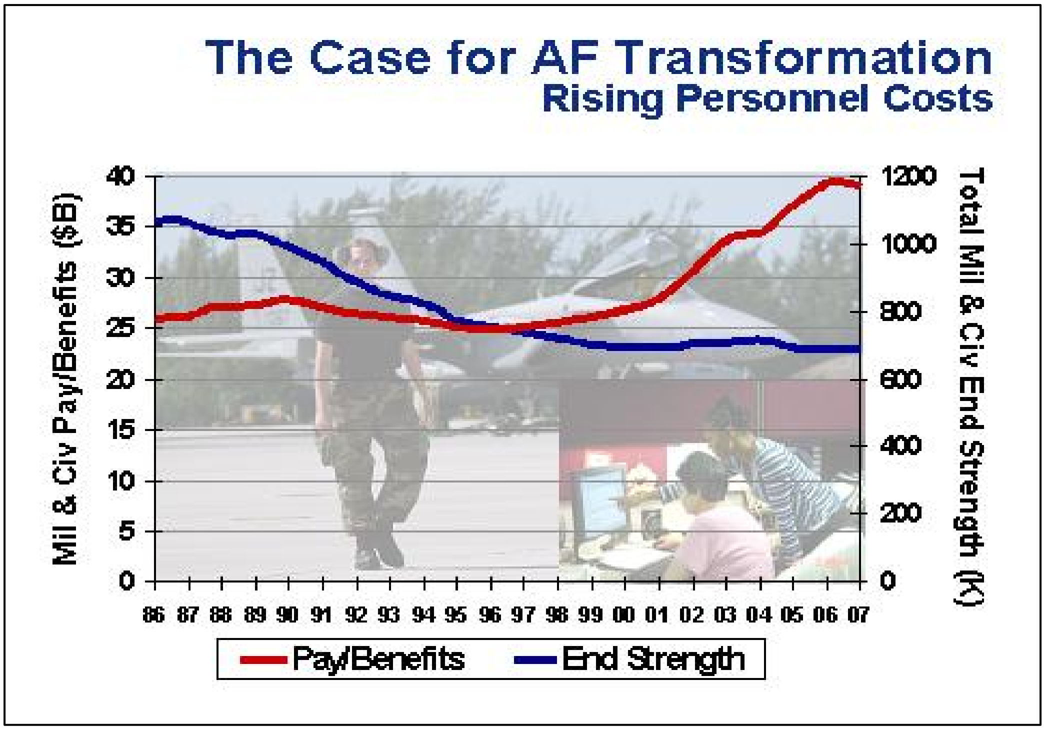

Figure 1 Rising Personnel Costs

Retired pay is but one component of the overall compensation system; however, with DoD retired pay outlays exceeding 35 billion of the 444 billion-dollar defense budget in Fiscal Year 2005, it represents a critical piece of the system (OSD, 2005a:54). Congress implemented the current military retirement program in 1947 to standardize a retirement system across both the armed services and among all ranks (Asch et al, 1998:1). Although it has undergone minor adjustments, it remains largely unchanged throughout its history: the system provides an immediate lifetime annuity to those who separate with 20 or more years of active duty service, but no benefits to those who separate with less than 20 years of service (Asch et al, 1998:1).

The purpose of retired pay in a hierarchical organization without lateral entry—such as the DoD—is different from the purpose of retired pay in an organization with it (Asch and Warner, 1994a:100). These organizations, like the military, groom their leadership from within their ranks, whereas a corporation may direct hire into senior positions and thus are not as concerned with generating turnover of older employees to create advancement opportunities for new hires (Asch and Warner, 1994a: 101). The retired pay system for a lateral-entry organization is designed to provide an incentive to the right people to aspire to higher ranks while at the same time encouraging others to leave at the right time (Asch and Warner, 1994a: 101). In short, an organization's retired pay system helps manage personnel flow. On the other hand, for firms that hire directly into senior positions, retired pay is not as important as a management tool since personnel flow is not as important. In organizations like these that do not exclusively groom from within, retired pay is utilized to provide workers with tax-sheltered savings opportunities (Asch and Warner, 1994a: 101). Further discussion and criticisms of the military's retired pay follows in the next section.

Criticisms of Retired Pay

Various critics have charged that the military's current defined benefit retirement system is excessively costly and unfair to taxpayers, unfair to the vast majority of military entrants who do not serve long enough to receive retirement benefits, inefficient, and inflexible (Asch et al, 1998:2). The first objective (excessive cost) is the thrust of this research paper--previous research and empirical data demonstrate the defined contribution plan is cheaper than the current defined benefit plan (Ambachtsheer, 1999:16, Costo, 2006:60, Duchac and Goldberg, 2006:24, and Kilgour, 2006:21). The other criticisms mentioned above are explained and addressed briefly. While there are tradeoffs associated with both defined benefit and defined contribution retirement systems, it is beyond the scope of this paper to compare and contrast each system. This paper focuses on the effect the return of a retirement system on retention, thus allowing decision-makers the ability to target the correct return rate should a transition occur in the DoD to a defined contribution plan.

Critics charge that it is unfair for 20-year retiree to receive a lifetime retirement annuity while others who serve for shorter periods receive nothing. The fact that only some 30 to 40 percent of officer entrants and 10 to 15 percent of enlisted entrants stay for a full 20-year career and receive benefits is seen to be unfair to those who receive no benefits for their time served (Asch et al, 1998:2 and Williams, 2004:75). This critique is largely myopic in nature, ignoring the fact that all service members are aware of the retirement requirements upon making the decision the join the military. Even so, a shift to a defined contribution retirement plan could mitigate this criticism, allowing members to be vested after as little as three years of service depending on the alternative chosen.

Opponents also deem the current system inefficient, suggesting that a more "up-front" compensation system would accomplish the same recruiting and retention objectives at a lower overall cost (Asch et al, 1998:19). The defined contribution plan may also address this criticism by offering more of the costs while the member is on active duty (via salary increase and matching contributions), thus minimizing the tail costs involved with a defined benefit plan.

Finally, critics also charge that the current military retirement system inhibits force management flexibility (Asch et al, 1998:3). Massachusetts Institute Technology's Cindy Williams (2004: 75) calls the retirement system outdated and rigid. Once a service member achieves a certain time in service (possibly around years 10-12), then he or she is "over the hump" and treated by organizational leadership as if he or she has an implicit contract to year 20 (Asch et al, 1998:3). Service leaders are hesitant to force all but the poorest performers out during this period for fear of the effect of involuntary separations on morale (Asch et al, 1998:3). Having a defined contribution system that allows vesting at an earlier time in service would remove this fear and allow greater flexibility in force management, because the member would separate with the money saved in the defined contribution plan (Asch et al, 1998:61). Table 1 below summarizes the criticisms levied on the defined benefit plan and the proposed remedies offered under a defined contribution system.

Table 1 Summary of Defined Benefit Criticisms and Defined Contribution Remedies

Criticism of Defined Benefit	Remedy through Defined Contribution
Excessive cost	Lower administrative costs and potentially lower total cost depending on the structure of the plan
Member receives no benefits unless remaining with the service for 20 years	Members eligible for benefits as early as three years
Not cost-effective with more back-loaded costs	More front-loaded compensation, less tail costs
Inhibits force management due to 20yr implicit contract	Early vesting could allow for greater force management

Retirement System Evolution in the Private Sector

One need not look far in the private sector to find examples of how the retired pay structures have changed significantly over recent history. Citing cost savings as the main driver, large companies have moved from defined benefit to defined contribution plans, including Alcoa, General Motors, Hewlett-Packard, IBM, Lockheed Martin, and Sprint Nextel (Geisel, 2006a:22). In 1985, 89 Fortune 100 companies offered a traditional defined benefit plan to new employees, compared with just 37 in 2005. (Geisel, 2006b:4). While most of these corporations may permit lateral entry, some principles behind their transitions may prove instructive to the current study.

General Motors and Texas Instruments shifted to a defined contribution plan over the course of several years, saving over one billion dollars in the process (Stoll, 2006: A.10 and Pruter, 1999:34). Both companies coupled this new plan with a detailed education system, considered to be crucial to the conversion's success. While outside the scope of the panel model that this research project is building, any decision to shift to a new retirement system should give careful consideration on the need for educating the military populace to the benefits in order to minimize potential morale problems and uncertainty associated with a new system.

IBM announced in 2006 that it was freezing its defined benefit plan in favor of the defined contribution system (Burr, 2006:2). Although a previous plan was somewhat of a hybrid defined benefit and defined contribution plan, management decided to eliminate the program in favor of an enhanced defined contribution retirement plan (Burr, 2006:3). Some of the improvements IBM provided to their employees included raising the company's matching percentages, raising the company default contribution rates (i.e., not subject to the employees even contributing to the system, and adding yearly bonuses to the 401 (k) plans. While the key driver in IBM's movement to a defined contribution plan was cost-related, the ability to make enhancements and adapt the plan quickly demonstrates the flexibility offered by defined contribution systems.

Perceptions abound that defined benefit systems offer more substantial returns than defined contribution systems (Kozal, 2003:41 and Calico, 2006:1). Empirical studies such as Johnston et al. (2001:43) paint a different picture, however. Johnson et al. demonstrate that defined contribution systems can exceed the returns of defined benefit plans provided that the individual has a high allocation of stocks, even with the occasional market downturn.

Key lessons from the private sector lie in two areas. The first area is the perception of fairness associated with the defined contribution system. Proper education and training of the features of a new retirement system is crucial to help offset any resistance to change and false perceptions that may arise as a result of a company altering an existing system. The panel model utilized in this study will not address this perception, but instead focuses on the second area, the financial mechanics of the implementation. Specifically, the ability to test whether or not the rate of return associated with a defined contribution system is able to meet or exceed our current retention goals at a lower overall cost.

Factors Influencing Retention

Researchers have tried to identify certain variables related to an individual decision to voluntarily change careers, and obtaining some key drivers for the turnover will shape the model described in the next chapter. Several studies show that continuation rates are a useful proxy for retention efforts (Fifield, 2006:24, Kostiuk et al., 1988, and Shiells and Reese, 1988:2). Based upon these studies, the continuation rate will serve as the dependent variable for this research project.

Shiells and Reese (1988:2) analyzed continuation rates of the Naval Reserve Force by geographical area, paygrade, length of service, rating, program entry into the Reserve, and type of ship. From this analysis paygrade and length of service were found to have strong impact on an individual's desire to remain in the Navy. Fullerton conducted a study concerning pilot retention and found the economy to be a significant factor in a member's decision to leave the service (2003:344). Hosek et al. (2006: xvi) found the operations tempo of the military (both home and abroad) of the military to be a significant factor on an individual's desire to re-enlist. From these three studies the variables extracted to this research's model are paygrade, the economy, and operations tempo. Warner and Pleeter (2001) analyzed personal discount rates of the military resulting from the drawdown beginning in 1992 and found a very high personal discount rate in comparison to previous studies. Of particular noteworthiness in this study is how Warner and Pleeter determined the present value of the retirement system in the form of an annuity, which this research will attempt to replicate. The next chapter will go into further descriptions of the variables and the methodology behind the panel model.

III. DATA AND METHODOLOGY

The purpose of this chapter is to describe the method used to build the model conceptually introduced in Chapters 1 and 2. Data were collected on the variables to build a cross-sectional, time-series panel model. Each variable is broken down by grade and year for each service. This cross-sectional look over a 15-year time period is long enough that it should be representative of times of high intensity conflict as well as times of relative peace and lower operations tempo.

Measures

Continuation rate. The dependent variable for this model is the continuation rate experienced by grade by year. The continuation rate defines a 'continuer' as an active duty member who has not changed services and remains in the service at the start and end of the year (Defense Manpower Data Center, 2006). This represents an individual deciding to stay in the service, and thus will be used as a proxy for retention. The Defense Manpower Data Center furnished the continuation rates by grade by year for 1990-2005.

Rank. Rank serves as an independent variable, as different decisions are faced at different intervals throughout a military career. For example, an E-4 with 7 years time in service will probably not have the same propensity to continue in the military than an E-7 with 17 years time in service. The grades E-1 through E-3 and O-1 through O-2 were not analyzed in this model, as the continuation rate is nearly 100 percent in these grades. This is due in part to members at these grades having service commitments obligating them to stay in the service, minimizing their ability to voluntarily leave the service. Thus, the continuation rates would not be affected should the DoD decide to switch from a defined benefit plan to a defined contribution plan. This leaves E-4 through E-9 and O-3 though O-10 as the grades to be regressed in the model.

Unemployment rates. Unemployment rates were used as an indicator of the overall health of the economy in terms of job availability. Previous research demonstrate that retention rates tend to be lower during economic an uptrend where a lower unemployment exists (Asch et. al, 2002:41 and Steel, 1996:421), and this annual percentage rate will help control the effects of the economy on the continuation rate. Unemployment rate data were received from the Bureau of Labor Statistics (BLS) for the years 1990-2005. The BLS does not have specific blue-collar and white-collar unemployment rates for the entire period analyzed. Therefore, separate unemployment rates were derived for enlisted and officer personnel, due to the differing unemployment opportunities available for each. This was done by obtaining various unemployment rates from the blue collar workforce and calculating an aggregate rate for the workforce to use as a proxy for the unemployment rate for the enlisted force. The same was also accomplished for the white collar workforce to use as an unemployment rate for the officer corps.

Contingency operations. War is modeled as a dummy variable as a indirect measurement for opstempo, and is coded as a "1" for the Gulf War, the conflict in Bosnia in 1999, and the period after September 11, 2001. During periods of war, higher operations tempo is experienced, and this will be accounted for in the model by the use of this dummy variable.

Higher Wage Rates. The variable entitled "additional military pay" represents the percentage of military pay raises over and above the Employment Cost Index (ECI). The ECI is a measure of the change in the cost of labor, free from the influence of employment shifts among occupations and industries (Bureau of Labor Statistics, 2006). The 9th QRMC (2002:40) confirmed that if the growth in military pay over the last 20 years is compared to the growth in private-sector wages (as measured by the ECI) over that same period, results show that military pay has increased at a rate between 5.5 to 13.5 percent slower than private-sector wages. The difference between annual military and the ECI was included in the model to help capture the effect of the increase on retention. Both ECI data and military pay increases were obtained by the DoD Office of the Actuary. Table 2 displays the military pay raise and resulting ECI change per year. This average military pay raise will be used across all services and ranks equally for the applicable year. While certain pay raises may have been targeted at specific grades, the percentages annotated here are the across-the-board percentage increases.

Table 2 Additional Military Pay Raises

Date of Increase	Mil Pay Raise	Private Pay Raise (ECI)	Delta (ECI-Pay)
01-01-90	3.6%	4.1%	-0.5%
01-01-91	4.1%	4.0%	0.1%
01-01-92	4.2%	3.7%	0.5%
01-01-93	3.7%	2.6%	1.1%
01-01-94	2.2%	3.1%	-0.9%
01-01-95	2.6%	2.8%	-0.2%
01-01-96	2.4%	2.8%	-0.4%
01-01-97	3.0%	3.4%	-0.4%
01-01-98	2.8%	3.9%	-1.1%
01-01-99	3.6%	3.9%	-0.3%
1/01/2000 *	4.8%	3.5%	1.3%
1/01/2001 *	3.7%	3.9%	-0.2%
1/01/2002 *	4.6%	3.8%	0.8%
1/01/2003 *	4.1%	2.7%	1.4%
1/01/2004 *	3.7%	3.0%	0.7%
01-01-05	3.5%	2.4%	1.1%
01-01-06	3.1%	2.6%	0.5%

* These across the board basic pay increases do not include additional targeted pay increases.

Rate of Return. The final independent variable in the model is the rate of return associated with the retirement plan. This rate of return will be expressed as a percentage based upon the retirement system in effect. Two different methodologies were employed to attempt to obtain a rate of retention. The first method was based upon a "retirement simulation," which proved to be ineffective in obtaining a proper, rational rate of return. This methodology will be discussed briefly, and the alternative methodology adopted—the actual yield of the Military Retirement Fund—will then be explained.

The author had planned to utilize a rate of return built upon the current defined benefit retirement system through a series of calculations dealing with the military pay gap. These calculations were based on a set of theoretical assumptions about the military pay gap difference as a substitute for the return needed to obtain the compensation annuity paid in the form of defined benefit retirement. A retirement simulation was conducted to compute the amount a service member "values" the retirement system over a higher-paying civilian job. To attempt to obtain this return, the annual pay gap between civilian jobs and the military was computed on each rank over the course of a 20-year career, and this amount was discounted to 2005 dollars. Then all of the years were added up and this lump sum serves as the present value of the overall compensation annuity. Once this amount is computed for that particular rank this would serve as the expected present value of the stream of the retirement pay annuity. The rate of return will would then be determined through present value analysis, using the following present value equation solved for the rate of return:

$$r = (FV/PV)^{1/n} - 1 \qquad (1)$$

where r = Rate of return

FV = Future value of the retirement plan annuity

PV = Present value of pay gap differential

n = Average number of years the annuity will be paid

The average number of years the annuity would be paid out differs for officers and enlisted, and this is another reason for developing two separate models. The Office of the Actuary estimated officers typically die around age 84, while the age for enlisted is around 80. Assuming retirement at 40, this would leave the *n at* 44 for officers and 40 for enlisted.

Unfortunately upon conducting the retirement simulation across all the ranks in all the services, the ensuing present value of the pay gap was too small to solve the annuity equation and obtain the rate of return. Typically the payback for the pay gap occurred within the first two years of retirement, resulting in an unlimited return for the rest of the service member's lifetime. One could conclude that the pay gap as it is currently measured does not adequately capture the real gap between military jobs and their civilian counterpart, but that is beyond the scope of this paper. Because this variable did not solve, a different proxy for rate of return was sought and found from the DoD Office of the Actuary, the actual yield of the military retirement fund. Although this is not the preferred measure of return, it does serve as an actual return experienced by the retirement fund as it stands today. Table 3 shows the retirement rates of return obtained from the Office of the Actuary used in the model.

Table 3 Military Retirement Fund (MRF) Yield

FY	MRF
1990	9.92%
1991	9.82%
1992	9.46%
1993	9.08%
1994	8.68%
1995	8.63%
1996	8.60%
1997	8.52%
1998	8.36%
1999	8.09%
2000	8.03%
2001	7.97%
2002	7.16%
2003	5.51%
2004	5.41%
2005	5.54%

Table 4 summarizes the variables associated with the model used in this analysis Now that each variable has been described, the panel regression model chosen for this analysis will be discussed.

Table 4 List of Variables

Variable	Description
Continuation Rate	Dependent variable to be used as a proxy for retention rates
Rank	Grade of the military individual
Higher Wage Rates	Percentage above the ECI
Unemployment Rates	Annual unemployment rate
Contingency Operations	Dummy variable to denote when the nation was at war
Rate of Return	Proxy for defined benefit plan and defined contribution

Panel Model Regression

To fulfill the study's primary purpose (i.e., determining the required retirement rate of return for a defined contribution system to meet DoD retention objectives), the testing and analysis will be conducted using a cross-sectional, time series panel model that predicts continuation rates. Panel data, also called longitudinal data or cross-sectional time series data, are data where multiple cases (people, firms, countries etc) are observed at two or more time periods (Kennedy, 2003:301). There are two kinds of information in cross-sectional time-series data: the cross-sectional information reflected in the differences between subjects, and the time-series information reflected in the changes within subjects over time. The model presented demonstrates the differences between subjects as shown as separate grades among separate service components. The time-series information is displayed across the 15 years of data presented in the analysis.

Panel data regression techniques allow the researcher to take advantage of these different types of information, mainly in controlling for omitted variable bias that sometime arises in doing ordinary least squares regression. Fixed effects regression is the model to use when desiring to control for omitted variables that differ between cases but are constant over time (Kennedy, 2003:302).

The panel model proposed in this research is that continuation rates (i.e., retention) are a function of rank, unemployment rate, war, additional military pay, and retirement return such that:

$$\text{Continuation Rate\%} = f\{\ \alpha + \beta_0 \text{Rank} + \beta_1 \text{Unemployment Rate} + \beta_2 \text{Additional Pay} + \beta_3 \text{ War} + \beta_4 \text{Return Rate} + \varepsilon_{it}\ \} \quad (2)$$

The fixed-effects panel model notation is:

$$y_{it} = \alpha + x_{it}\beta + \varepsilon_{it} \quad (3)$$

where i = {Air Force, Army, Navy, Marines}

t = {1990,1991,…2005}

β = The vector of coefficients

x_{it} = The vector of regressors (listed in Table 4)

ε = Error term

α = Constant

Different diagnostic tests will be conducted to ensure each model (one for officer and one for enlisted) has appropriate explanatory power. Once the panel model is run and the coefficients estimated for the significant variables, this could form the basis for the change to a defined contribution plan. Policy implications, such as shifting to a defined contribution plan and potential challenges associated with such a move, will be addressed in chapters four and five.

IV. ANALYSIS AND RESULTS

The purpose of this chapter is to explain the processes that were undertaken to analyze the data and models discussed in earlier chapters. As stated previously, two models were constructed to allow for differences experienced in officer and enlisted ranks. Common statistical methods applied to the models--both pre-estimation and post-estimation--will be briefly discussed. Then each of the models will be evaluated independently in terms of execution and results.

Pre-Estimation Tests

The data was first tested for stationarity using the Augmented Dicky Fuller (ADF) and similar unit root tests. Stationarity exists when the statistical properties of the variables do not change over time (Kennedy, 2003:324). In time series, interpretation from analysis that uses non-stationary data can lead to spurious results and erroneous conclusions regarding relationships among the variables (Kennedy, 2003:319). All datasets used in this research were found to be stationary in nature.[1] The tests employed to determine if a variable has a unit root (and thus is stationary) can be found at Appendix A.

The Akaike Information Criteria (AIC) was reviewed for several different preliminary regressions based on varying lag lengths of the variables and autoregressive (AR) specifications. The AIC is a popular way of determining the goodness of fit of the model while maintaining parsimony (Kennedy, 2003:117). Smaller AICs indicate better

---

[1] Of the three tests employed to determine stationarity, one (the Hadri Z stat) showed partial stationarity, and full results can be found at Appendix A

fitting models, in conjunction with maximizing the adjusted R-squared. For the enlisted model the optimal lag for this analysis was determined to be a one-year lag accompanied with 2 AR specifications. This one-lag, 2-AR model yielded an AIC 4.29 while simultaneously achieving an adjusted R-squared of over .99. The lag length for the officer model proved to be the most effective at a 2-year lag accompanied with 2 AR specifications. This would indicate that officers may contemplate whether or not to leave the service for a longer period of time before actually leaving the service as opposed to the 1-year lag in the enlisted model.

Post-Estimation Tests

To determine independence of the residuals in each model, the Durbin-Watson (DW) test statistic was calculated. Not to have independence of the residuals could result in autocorrelation and jeopardize the findings. Autocorrelation can be corrected by adding an autoregressive (AR) specification term to the model estimates. In each of the models an AR term was added as determined from the analysis of the AIC discussed above. The enlisted model DW statistic was computed at 2.07 while the officer model measured 1.96. Further detail of the Durbin-Watson results are shown in the applicable appendix for the panel models. With all the model specifications computed and validated, the results will now be discussed and each model examined independently of one another.

Enlisted Model Results

Table 5 summarizes the results of the enlisted model. The grades studied began at E-5 and went through E-9 from all service components (Air Force, Army, Navy, and Marines). A total of 264 balanced observations were analyzed over a 15-year period. As previously discussed, the type of analysis conducted was a panel model with one year lags on the independent variables as well as two autoregressive specifications included in the regression. Interesting to note that in this model only two variables were found to be statistically significant--the rate of return associated with the retirement plan and whether or not a contingency operation was in effect. Additional pay over and above the ECI and the unemployment rate were both significant to the 13 percent and 16 percent, respectively, so these variables just missed significance. With an adjusted R-squared of 0.9942 this model explains the majority of the variation in continuation rates, and with a Durbin Watson measure of 2.07 autocorrelation is not present. Each of the significant variables will be briefly discussed. Full results of the panel model can be found at Appendix B.

Table 5 Enlisted Panel Model Results

Variable	Coefficient		t-Statistic	Prob.
RETURN(-1)**	44.62417		2.56994	0.0108
WAR(-1)***	1.344739		4.45990	0.0000
ADDPAY(-1)	27.75447		1.52833	0.1278
UNEMP(-1)	-0.194100		-1.40436	0.1615
AR(1)	0.168055		3.02054	0.0028
AR(2)	0.073566		1.34192	0.1809
R-squared	0.994718	Akaike info criterion		4.29468
Adjusted R-squared	0.994153	Schwarz criterion		4.65075
Durbin-Watson stat	2.078899			

***significant to the 0.001 level, **0.05 level, *0.10 level

Rate of Return. The rate of return was found to be significant to the .011 level, and the magnitude was the highest of any variable in the model (significant or otherwise). With a positive coefficient, this would mean that as rate of return of the retirement plan increases an individual would have a greater propensity to remain in the military. This intuitively makes sense as one would expect higher rates of return to increase continuation rates within the military.

Contingency Operations. Whether or not the nation was involved in contingency operations had the most significance in the model, but very little magnitude associated with it. This indicates that high operations tempo may weigh heavily on an individual's mind on whether or not to remain in the military, but may not be heavily acted upon in the end.

While the enlisted model gave results that were expected, the officer model discussion that follows shows that two separate models were indeed needed to adequately describe the differing patterns associated between the two groups of people.

Officer Model Results

Table 6 summarizes the officer panel model. The grades that were examined began at O-3 and went through O-10 from all service components (Air Force, Army, Navy, and Marines). A total of 384 balanced observations were analyzed over a 15-year period. This model did not prove to have the power of the enlisted model, as the diagnostic tests show with an adjusted R-squared of 0.4769 and Durbin Watson 1.96. The measures prove to vary greatly from those of the enlisted model, and judging from the vast differences in results one can conclude that the officer model fails to account for the majority of the decisions affecting whether or not one chooses to remain in the military or seek alternative employment. The significant variables will again be discussed as was done in the enlisted model, but in light of the overall officer results the policy implications available to decision makers will be limited. Again only two variables were found to have significance, those being rate of return and unemployment rate. Contingency operations had almost no significance (possibly because far fewer officers in the Army and Marines deploy compared to enlisted, and Air Force pilots are already well compensated), and additional pay was significant to the .2479 level. Full results of the officer model can be found at Appendix C.

Table 6 Officer Panel Model Results

Variable	Coefficient		t-Statistic	Prob.
RETURN(-2)**	-95.3190		-2.11479	0.0352
WAR(-2)	-0.1158		-0.10515	0.9163
ADDPAY(-2)	69.1032		1.15736	0.2479
UNEMP(-2)**	-1.7884		-3.01797	0.0027
AR(1)	-0.3683		-6.77737	0.0000
AR(2)	-0.2106		-3.83405	0.0001
R-squared	0.527423	Akaike info criterion		7.00445
Adjusted R-squared	0.476887	Schwarz criterion		7.39540
Durbin-Watson stat	1.956114			

***significant to the 0.001 level, **0.05 level, *0.10 level

Rate of Return. Once again, the rate of return was found to have the most magnitude of any variable. However, in the officer model the coefficient was negative, which was not expected. This would indicate that as the rate of return increases, the desire to separate from the service would increase. A possible explanation of this result is that the rate of return was lower than expected, causing the officer to seek employment alternatives. Still another explanation may be that Military Retirement Fund is not as good as proxy for rate of return for officers as it is for enlisted. Finally, the rate of return variable being negative may simply show that something else (in addition to the retirement plan's rate of return) may have an effect on the officer's retention decision, something that is not currently captured in the model (more on this in the following section).

Unemployment Rate. The unemployment rate was the most significant variable in the officer model with a measure of 0.0027. This indicates that the state of the economy and the job picture is much more important to the officer making a decision on whether to separate more so than the enlisted. The coefficient is negative, indicating that when the unemployment rate increases, retention decreases, which again is counter-intuitive to what one would expect. This may be explained by a “patriotic” or “calling” variable that is extremely hard (if not impossible) to measure. Another possible explanation is that members of the officer corps may separate for reasons other than the general economy (e.g., family separations and deployments). Again, the low adjusted R-squared makes it apparent that something is missing from this model. The way the officer is supposed to view his or her position as a “calling” versus a “job” may explain why not only the unemployment rate coefficient is negative, but also why it has very little magnitude on one’s decision to remain in the service.

V. CONCLUSION

This chapter will address the overall findings of the analysis and provide an overall assessment of the research conducted in light of potential policy implications. Tying the previous chapters together will help provide some potential action areas by decision makers. Finally, this chapter will offer suggestions for future research in the context of military retirement analysis in general and defined contribution plans in particular.

Overall Summary and Implications

While numerous studies have been conducted on the military retirement system and offered a plethora of alternative ideas to our current defined benefit retirement system, none up to this point had given a target return rate for the alternative program to achieve in order to maintain our current retention levels. From the outset this research attempted to find the effect that the retirement plan's rate of return had on retention levels so as to bridge the gap between past research and the eventual transition to a defined contribution system that many decision makers believe is inevitable. Making a blind overhaul of our current retirement system without fully counting the costs of such a move could prove disastrous results to our readiness levels, and DoD leadership should weigh on the potential cost-saving benefits in light of the pitfalls that exist and have been discussed in previous research. This research adds yet another building block to the process, and the author believes several areas of future research may shed even more light on the potential to save money while simultaneously maintaining individual goals and personnel readiness of our nation's military.

The research was built around the following question, "How does the retirement plan's rate of return influence retention?" Through panel regression analysis it was found that the retirement plan's rate of return does influence a member's decision on whether or not to remain in the military or seek alternative employment. By separating officers from the enlisted force it was expected to better capture the nuances associated with each group. This proved to be a correct method as the enlisted model explained retention rates to a strong degree of accuracy. The officer model did not experience the same goodness of fit, and as previously mentioned this shows that the model was not complete in assessing all of the criteria an officer evaluates before making a decision to remain in the service or separate and find another job.

The greatest potential in the thesis lies in capturing the rate of return of our current retirement system. The author attempted to capture this through present value analysis of the pay gap between the military and civilian sectors and using this as a proxy for return of the retirement system over the life of a career military member. This calculation was attempted by conducting a retirement simulation of applicable ranks from 1990-2005 and using the cumulative pay gap as the future value of an annuity due. However, the pay gap as currently measured did not result in a high enough dollar amount to solve the rate of return equation, suggesting an infinite return.

As discussed, the enlisted model proved to have greater statistical power and stronger diagnostic tests, and overall, the goodness of fit is much better in this model than the officer model. Given that the officer model's adjusted R-squared is almost half of the enlisted, one may reasonably conclude that there is some decision criteria not captured in the officer model. The author has attempted to explain the missing characteristic as some sort of “patriotic” factor or “calling” aspect of the military officer that may not be as heavily prevalent in the enlisted force. The current environment of the political and military leadership continues to transform our armed forces to a business mindset and less of a calling. As this mindset gains footing in the officer corps, the author believes that the officer model will behave closer to the enlisted model, as the somewhat intangible “calling” aspect gives way the business viewpoint.

The rate of return variable showed the greatest magnitude in both models, finding strong significance as well. This variable was lagged one year in the enlisted model; demonstrating enlisted members tend to think about separating decisions a year prior to actually making the choice. The only other significant variable in the enlisted model was the contingency variable (also lagged one year), meaning that members do take into consideration whether or not the nation is at war (i.e., experiencing higher operations tempo) when determining to stay in or get out of the military. Additional pay above the ECI and the state of the economy as shown in the unemployment rate did not statistically affect one’s retention decision. Both variables did just miss significance, however, and the magnitude of the additional pay was second only to the rate of return of the retirement plan. This research does not show that these variables simply don’t matter, rather that the other two variables have a greater impact on the member’s retention decision.

While the officer model did not have the same intuitive results, a noteworthy result from the analysis is the significance of the rate of return variable. While not effectively capturing the variation involved in an officer’s desire to remain in the military or seek alternative employment, this research has laid the groundwork for future endeavors to model officer behaviors in the same vein that enlisted attitudes have been analyzed.

Suggestions for Further Research

The potential for further research in this area is far-reaching as the retirement debate rages on in academic circles. As discussed in the literature review, the private sector has made a significant transition from the traditional defined benefit retirement system to that of a defined contribution system. The author believes that the DoD will eventually adopt a similar program for the military population citing the same rationale as the private sector, that of cost savings. The research conducted in this paper is the first step towards achieving the goal of a cost-effective plan while not eroding the military member’s benefit scheme. The next step is to take the results of this thesis and develop different defined contribution plans that achieve the same rate of return results and thus maintain our present retention rates. Evaluating defined contribution alternatives in light of their potential effects on retention rates will allow decision makers to develop more enlightened and robust set of action steps if the defined contribution plan is ever implemented as DoD’s sole military retirement vehicle. Each of the alternatives discussed should not neglect the implementation scheme associated with the plans, as past records indicate that training and education during the transition is essential to any program’s success (and thus retention levels remaining stable).

Another area for further research lies in fine-tuning the rate of return variable. More research is needed to determine if the Military Retirement Fund yield is the best proxy available for our retirement system. While the author attempted to find another variable, time constraints and data availability prevented an exhaustive search. A more rigorous variable could help achieve better results in the officer model, which proved to be the greatest area for improvement in this research.

This leads to the final area recommended for further research; the development of an officer model with the same explanatory power then that of the enlisted force. The “patriotic” factor or “calling” aspect is indeed an elusive variable that could have extensive impact on the results if modeled correctly. Additional variables may also need to be considered, such as public opinion of the military, stressed career fields that deploy more than others, or the addition of the Thrift Savings Plan as an investment vehicle.

Conclusion

This research investigated the effect that the defined benefit retirement system has on retention rates in the armed forces. Clearly the retirement benefits experienced in the military have an effect on an individual’s desire to remain in the service or shift to the private sector. The research conducted in this endeavor is a positive step forward in determining the proper steps to modify the retirement system and mitigate the negative effects of that modification. This research effort expanded the current knowledge base of military retirement analysis through regressing the various decision criteria that go into the final decision to remain or leave the military and finding the magnitude of the retirement’s rate of return on that decision. Decision makers at the highest levels should utilize this additional knowledge on the backdrop of previous research should the transition of the current retirement system come to fruition. Adding to the current inventory of knowledge will help aid the DoD leadership make an informed, accurate, and defendable decision in achieving retention goals that benefit the nation (lower costs) and the individual (proper return rate).

APPENDIX A—Unit Root Test for Stationarity

Group unit root test: Summary Enlisted
Date: 12/16/06 Time: 19:35
Sample: 1990 2005
Series: Continuation Rate
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on AIC: 0 to 3
Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
*Levin, Lin & Chu t**	-7.28323	0	18	250
Breitung t-stat	-3.23465	0.0006	18	232
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.13409	0	18	250
ADF - Fisher Chi-square	112.302	0	18	250
PP - Fisher Chi-square	116.265	0	18	270
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	3.31877	0.0005	20	320

** Probabilities for Fisher tests are computed using an asympotic Chi
-square distribution. All other tests assume asymptotic normality.

Group unit root test: Summary Officer
Date: 12/16/06 Time: 19:30
Sample: 1990 2005
Series: Continuation Rate
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on AIC: 0 to 3
Newey-West bandwidth selection using Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
*Levin, Lin & Chu t**	-12.9781	0.00000	32	463
Breitung t-stat	-7.87877	0.00000	32	431
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-10.9514	0.00000	32	463
ADF - Fisher Chi-square	238.649	0.00000	32	463
PP - Fisher Chi-square	289.299	0.00000	32	480
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	8.3985	0.00000	32	512

** Probabilities for Fisher tests are computed using an asympotic Chi
-square distribution. All other tests assume asymptotic normality.

APPENDIX B – Full Enlisted Panel Model Results

Dependent Variable: ?_CONT
Method: Pooled Least Squares
Date: 12/15/06 Time: 15:23
Sample (adjusted): 1993 2005
Included observations: 13 after adjustments
Cross-sections included: 20
Total pool (balanced) observations: 260
Convergence achieved after 9 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	73.2954	1.76676	41.48578	0
RETURN(-1)	44.62417	17.3639	2.569939	0.0108
WAR(-1)	1.344739	0.301518	4.459895	0
ADDPAY(-1)	27.75447	18.15997	1.528333	0.1278
UNEMP(-1)	-0.1941	0.138212	-1.40436	0.1615
AR(1)	0.168055	0.055637	3.020542	0.0028
AR(2)	0.073566	0.054822	1.341917	0.1809

E5USAF--C	16.54878
E6USAF--C	15.31008
E7USAF--C	6.777748
E8USAF--C	5.729094
E9USAF--C	2.49296
E5USA--C	9.20632
E6USA--C	-76.16029
E7USA--C	-76.16029
E8USA--C	3.567072
E9USA--C	5.313725
E5USN--C	12.15547
E6USN--C	12.32569
E7USN--C	10.70866
E8USN--C	6.213733
E9USN--C	4.669771
E5USMC--C	5.488899
E6USMC--C	14.78406
E7USMC--C	11.86491
E8USMC--C	5.171949
E9USMC--C	3.991682

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.994718	Mean dependent var	76.15115
Adjusted R-squared	0.994153	S.D. dependent var	25.84255
S.E. of regression	1.976011	Akaike info criterion	4.294677
Sum squared resid	913.6814	Schwarz criterion	4.650746
Log likelihood	-532.3081	F-statistic	1762.591
Durbin-Watson stat	2.078899	Prob(F-statistic)	0

APPENDIX C – Full Officer Panel Model Results

Dependent Variable: ?_CONT
Method: Pooled Least Squares
Date: 12/15/06 Time: 15:10
Sample (adjusted): 1994 2005
Included observations: 12 after adjustments
Cross-sections included: 32
Total pool (balanced) observations: 384
Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	98.25402	3.825123	25.6865	0
?_ADDPAY(-2)	69.10321	59.70771	1.157358	0.2479
WAR(-2)	-0.115754	1.100849	-0.10515	0.9163
UNEMP(-2)	-1.788383	0.592578	-3.017973	0.0027
RETURN(-2)	-95.31904	45.07255	-2.114791	0.0352
AR(1)	-0.368257	0.054336	-6.777365	0
AR(2)	-0.210637	0.054939	-3.834047	0.0001
O3USAF--C	7.167251			
O4USAF--C	6.250593			
O5USAF--C	3.641995			
O6USAF--C	-1.13916			
O7USAF--C	4.605289			
O8USAF--C	-1.1944			
O9USAF--C	-7.817193			
O10USAF--C	-8.644691			
O3USA--C	5.867545			
O4USA--C	7.831968			
O5USA--C	4.022215			
O6USA--C	-0.901919			
O7USA--C	6.158964			
O8USA--C	-2.039956			
O9USA--C	-10.35147			
O10USA--C	-11.19163			
O3USN--C	4.013929			
O4USN--C	6.064495			
O5USN--C	5.619769			
O6USN--C	0.458381			
O7USN--C	4.516139			
O8USN--C	-7.670491			
O9USN--C	-8.435054			
O10USN--C	-13.10012			
O3USMC--C	5.70699			
O4USMC--C	8.198103			
O5USMC--C	4.144481			
O6USMC--C	0.978368			
O7USMC--C	9.631679			
O8USMC--C	-1.43369			
O9USMC--C	-5.306284			
O10USMC--C	-15.6521			

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.527423	Mean dependent var	84.08984
Adjusted R-squared	0.476887	S.D. dependent var	10.59529
S.E. of regression	7.663204	Akaike info criterion	7.00445
Sum squared resid	20318.75	Schwarz criterion	7.395399
Log likelihood	-1306.854	F-statistic	10.43664
Durbin-Watson stat	1.956114	Prob(F-statistic)	0

REFERENCES

Ambachtsheer, Keith P. “Cost effectiveness of DB funds vs. 401(k)s.” *Pensions & Investments*; 25 January 1999, Vol. 27 Issue 2 p.16.

Asch, Beth, James R. Hosek, Jeremy Arkes, C. Christine Fair, Jennifer Sharp, and Mark Totten. *Military Recruiting and Retention After the Fiscal Year 2000 Military Pay Legislation* Santa Monica, Calif.: RAND Corporation, 2002.

Asch, Beth J., and John T. Warner, *A Policy Analysis of Alternative Military Retirement Systems*, RAND, 1994b.

Asch, Beth J., and John T. Warner, *A Theory of Military Compensation and Personnel Policy*, RAND, MR-439-OSD, 1994a.

Asch, Beth J., Richard Johnson, and John T. Warner. *Reforming the Military Retirement System*, Santa Monica, Calif.: RAND Corporation, MR-748-OSD, 1998.

Brady, Roger, Lt General. *Building the 21st Century Air Force*, Address to Air Force Institute of Technology Intermediate Developmental Education Students. Air Force Institute of Technology, Wright-Patterson AFB, OH. June 2006

Burr, Barry B. “IBM's decision to freeze its plan may accelerate trend to drop DB” *Pensions & Investments*, Chicago: Jan 9, 2006.Vol.34, Iss. 1; pg. 2-3.

Bureau of Labor Statistics. *BLS Glossary*. 24 August 2006. Washington, DC http://www.bls.gov/bls/glossary.htm.

Calio, Vince. "Strategists: Don't cook the DB goose; 'Bad defined benefit plan is better than a good DC plan'." *Pensions & Investments* 34.13 June 26, 2006 p.1.

Chassen, Arnold J. "Whatever happened to defined benefit plans?" *Management Accounting (USA)* 72.n1 July 1990:18.

Costo, Stephanie L. “Trends in retirement plan coverage over the last decade,” *Monthly Labor Review*. Washington: Feb 2006. Vol. 129, Iss. 2; p. 58-63.

Defense Manpower Data Center. *Officer and Enlisted Continuation Reports*. Annual. D 10 August 2006. California. https://www.dmdc.osd.mil/appj/ids/index.jsp

Duchac, Jon and Stephen R. Goldberg "Controlling Pension Costs: Why Is It So Difficult?" *The Journal of Corporate Accounting & Finance,* March/April 2006 p. 23-29.

Fifield, JoAnn M. *A Multivariate Analysis of Retirement Intentions of Enlisted Naval Reservists* Naval Postgraduate School Monterey CA AD Number: ADA445425 2006.

Freedberg, Sydney J Jr. “Retirement Redux.” *Government Executive*. Washington: Apr 1999.Vol.31, Iss. 4; pg. 35-40.

Friedberg, Leora, and Anthony Webb. *Retirement and the Evolution of Pension Structure*, Cambridge, Mass.: National Bureau of Economic Research, Working Paper No. 9999, 2003.

Fullerton, Richard L. “An Empirical Assessment of US Air Force Pilot Attrition,” *Defense and Peace Economics,* Volume 14 October 2003.

Geisel, Jerry. “Big chill for pensions as plan freezes grow,” *Business Insurance* (March 2006a) *40*(13), 1, 22-23.

-----. “Fortune 100 employers exiting traditional, hybrid pension plans,” *Business Insurance* (May 2006b) 40(13), 1, 4-6.

General Accountability Office (GAO). *Global War on Terrorism: Observations on Funding, Costs, and Future Commitments*, GAO-06-885T, July 18, 2006, 23pg.

Hosek, James, Jennifer Kavanagh, Laura Miller. *How Deployments Affect Service Members*, RAND Corporation, Santa Monica, CA 2006.

Johnston, Ken, Shawn Forbes, John Hatem. "A comparison of state university defined benefit and defined contribution pension plans: a Monte Carlo simulation." *Financial Services Review*, Nov 2001. Vol 10 pg 37-44.

Kennedy, Peter. *A Guide to Econometrics (Fifth Edition)*. Massachusetts: The MIT Press, 2003.

Kozol, George B. “Defined-benefit plans emerge as a better choice for held businesses” Journal of Financial Service Professionals. Bryn Mawr: Mar 2003. Vol. 57, Iss. 2, p. 41-47.

Kostiuk, Peter F., Dean A Follman., and Martha Shiells. *Utilization of Personnel Resources Within The Navy Selected Reserve*. (Research Memorandum Mo. CRM 88-155). Alexandria, Virginia: Center for Naval Analyses 1988.

Kilgour, John, "Public Sector Pension Plans; Defined Benefit vs. Defined Contribution," *Compensation and Benefits Review* Vol 38 20-28 Jan/Feb 2006.

Office of the President, United States of America. Memorandum for the Secretary of Defense Subject: Tenth Quadrennial Review of Military Compensation. Washington: 2 August 2005.

Office of the Secretary of Defense (OSD). *FY 2007 President's Budget, Exhibit M-1*, OSD Comptroller, Washington: GPO. February 2006, 64 pg.

-----, *Military Compensation Background Papers*, 6th Edition, Washington: GPO May 2005 Vol II, 89 pg.

-----, *Air Force Transformation Flight Plan, Program Budget Decision 720*, Washington: GPO December 2005, 13 pg.

Pruter, Robert. "Texas Instruments' corporate restructuring drives conversion from DB to DC plan" *Employee Benefit Plan Review* New York: Oct 1999. Vol. 54, Iss. 4, p. 34-36.

Savych, Bogdan. *Toward Incentives for Military Transformation: A Review of Economic Models of Compensation*, Santa Monica, Calif.: RAND Corporation, RB-7533, 2000.

Shiells, Martha E. and David L. Reese. *Retention in the Naval Reserve Force*. Document No. CRM 88-29. Alexandria, Virginia. Center for Naval Analyses 1988.

Shankar, S. Gowri, and James M. Miller. “Retirement Plan Choices and Outcomes.” *Business Horizons* July-August 2003.

Steel, R. P. “Labor Market Dimensions as Predictors of the Reenlistment Decisions of Military Personnel.” *Journal of Applied Psychology*, Vol 81 Issue 4: 421-428.

Stoll, John D. "*GM to Freeze Pension Plans of White-Collar Workers*," Wall Street Journal. (Eastern Edition). New York, N.Y.:Mar 8, 2006. p. A.10.

United States Congress. *37 U.S.C. 1008(b)*. Public Law No. 132, 89th Congress, 2nd Session Washington: GPO 1965.

United States Congress. *National Defense Authorization Act for Fiscal Year 2007*. House Report 452, 109th Congress, 2nd Session Washington: GPO 2006

Warner, John T. and Pleeter, Saul. "The Personal Discount Rate: Evidence from Military Downsizing Programs," American Economic Review; Mar 2001, Vol. 91 Issue 1, p33-53, 21pg.

Williams, Cindy. “ Forget the Draft“ *Government Executive*, Washington: Sep 15, 2004. Vol. 36, Iss. 16.

VITA

Major Derren Burrell was raised in Greenville, SC, where he graduated from Riverside High School in 1990. Upon graduation he attended The Citadel, the Military College of South Carolina, where he ran Track and Cross-Country on scholarship. He graduated from The Citadel in 1994. He received his Masters in Human Resources from Central Michigan University in 1996.

Major Burrell was commissioned through the Reserve Officer Training Corps unit at The Citadel and entered active duty in May 1994. Previous assignments include tours at both CONUS and overseas bases as a Budget Flight Commander and Finance Flight Commander. Before his current tour he served as a budget analyst and executive officer on the Air Force Secretariat at the Pentagon. He has also served as a deployed Comptroller on the front line in Operations SOUTHERN WATCH and ALLIED FORCE. In August 2005, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology, to obtain his Master of Science degree in Cost Analysis.

Major Burrell is a Certified Defense Financial Manager and past recipient of several awards including Meritorious Service Medals, Air Force Commendation Medals, an Air Force Expeditionary Medal and an Air Force Achievement Medal for meritorious service. He was also awarded distinguished graduate honors at both the Budget Officer School and Financial Management Staff Officer courses taught at Sheppard Air Force Base, Texas. While stationed at Royal Air Forces Lakenheath, UK, in 1999 he was awarded the Best Budget Officer in the Air Force.

REPORT DOCUMENTATION PAGE						*Form Approved* *OMB No. 074-0188*
The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to an penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**						
1. REPORT DATE *(DD-MM-YYYY)* 23-06-2007			**2. REPORT TYPE** **Master's Thesis**			**3. DATES COVERED** *(From – To)* August 2005-March 2007
4. TITLE AND SUBTITLE An Analysis Of The Military Retirement System: How Does Retirement Return Influence Retention?						**5a. CONTRACT NUMBER**
						5b. GRANT NUMBER
						5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) DERREN P. BURRELL, Major, USAF						**5d. PROJECT NUMBER**
						5e. TASK NUMBER
						5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S) Air Force Institute of Technology Graduate School of Engineering and Management (AFIT/EN) 2950 Hobson Way, Building 641 WPAFB OH 45433-7765						**8. PERFORMING ORGANIZATION REPORT NUMBER** AFIT/GCA/ENV/07- M3
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A						**10. SPONSOR/MONITOR'S ACRONYM(S)**
						11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.						
13. SUPPLEMENTARY NOTES						
14. ABSTRACT The cost of the current Department of Defense (DoD) defined-benefit retirement plan has long been a source of consternation within Congress and the DoD (Freedberg, 1999:35). Billed as being too costly in the private sector, many firms have elected to switch from defined benefit plans to defined contribution plans, most often a 401K retirement plan (Chassen, 1990:18). This thesis attempts to capture the effect of the current military retirement plan on rates of retention. The goal of this study is to be used as a tool should the Department of Defense decide to move from a defined-benefit plan to a defined-contribution plan. Previous studies (e.g., Asch et al., 1998) have explored different methods in comparing various retirement systems, largely based on organizations meeting their retention and performance goals. The model introduced in this study will test the extent to which the rate of return associated with the current military retirement system influences the organization's retention goals while simultaneously helping the individual meet his or her long-term financial security goals.						
15. SUBJECT TERMS Military Retirement, Defined Benefit, Defined Retirement, Retention Rates, Continuation Rates, Panel Model, Regression						
16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**		**19a. NAME OF RESPONSIBLE PERSON** Lt Col Jeffrey Smith (ENV)
a. REPORT U	**b. ABSTRACT** U	**c. THIS PAGE** U	UU	37		**19b. TELEPHONE NUMBER** *(Include area code)* (937) 255-3636, ext 7393 (Jeffrey.smith@afit.edu)

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18